SIZE-SELECTIVE MICROZOOPLANKTON GRAZING ON THE PHYTOPLANKTON IN THE CURONIAN LAGOON (SE BALTIC SEA)

Evelina Grinienė[1,2], Harri Kuosa[3]

[1] Open Access Centre for Marine Research, Klaipeda University, Lithuania.
[2]Marine Science and Technology Center, Klaipeda University, Lithuania.
[3]Finnish Environment Institute (SYKE), Marine Reasearch Centre, Helsinki, Finland.

e-mail: ***evelina.griniene@apc.ku.lt***

Introduction

Microzooplankton (size category 20 to 200 μm) grazers, usually dominated by protists, can remove up to 60–75% (about 2/3) of daily primary production (PP), with the remaining 1/3 being chanelled directly through mesozooplankton or lost by viral lysis, settling and advection processes (Calbet, 2008; Landry and Calbet, 2004; Schmoker et al., 2013).

The dilution method for microzooplankton grazing estimation has been used only in a few Baltic Sea studies (Aberle et al., 2007; Lignell et al., 2003; Moigis and Gocke, 2003; Reckermann, 1996). In this study we focused on microzooplankton grazing rates in eutrophic coastal lagoon (Fig. 1). We applied dilution experiments and phytoplankton size-fractionation to experimentally evaluate the differences in microzooplankton and phytoplankton community structures, grazing and growth rates between the fresh-water and brackish water parts of the lagoon. The experiments were made with two communities representing the two extremes of the habitat: a high salinity sample from an area with extreme salinity variability, and a freshwater sample from an area with constant freshwater regime.

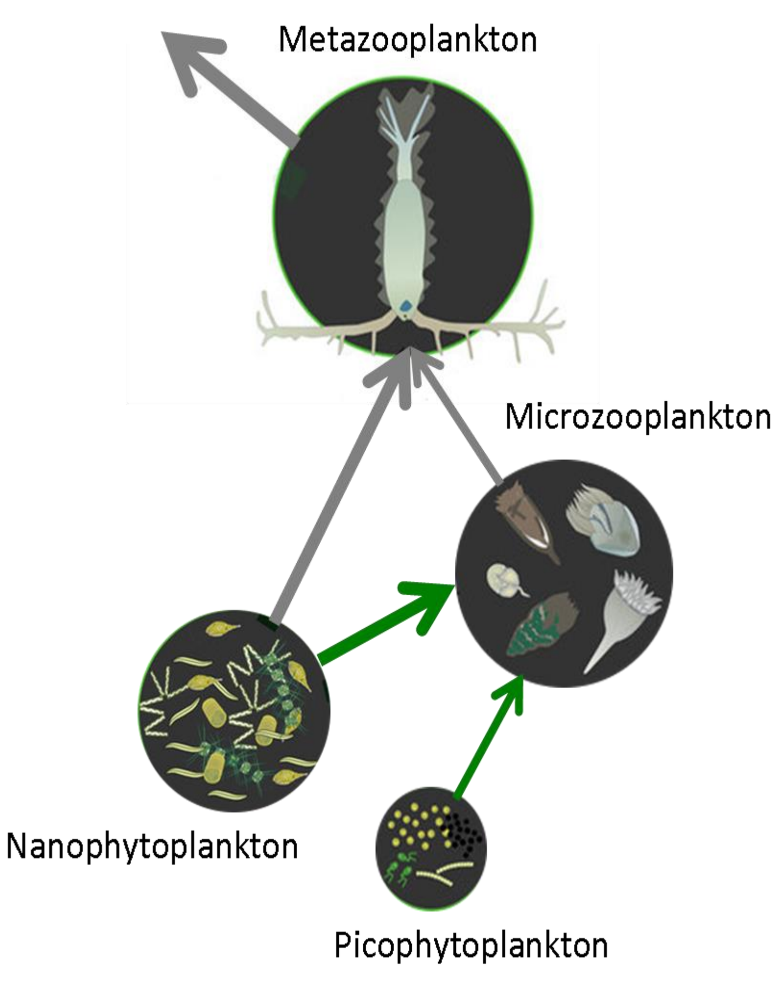


Fig. 1. *Green arrows indicate links focused in this study. Scheme modified by D'Alelio et al. 2015.*

Our hypothesis is that the grazing efficiency varies according to the microzooplankton community structure.

Phytoplankton community structure

At both sites the picofraction of phytoplankton was represented only by chlorophyll *a*, whereas the nanofraction of phytoplankton contained additional pigments and varied between sites (Fig. 3).

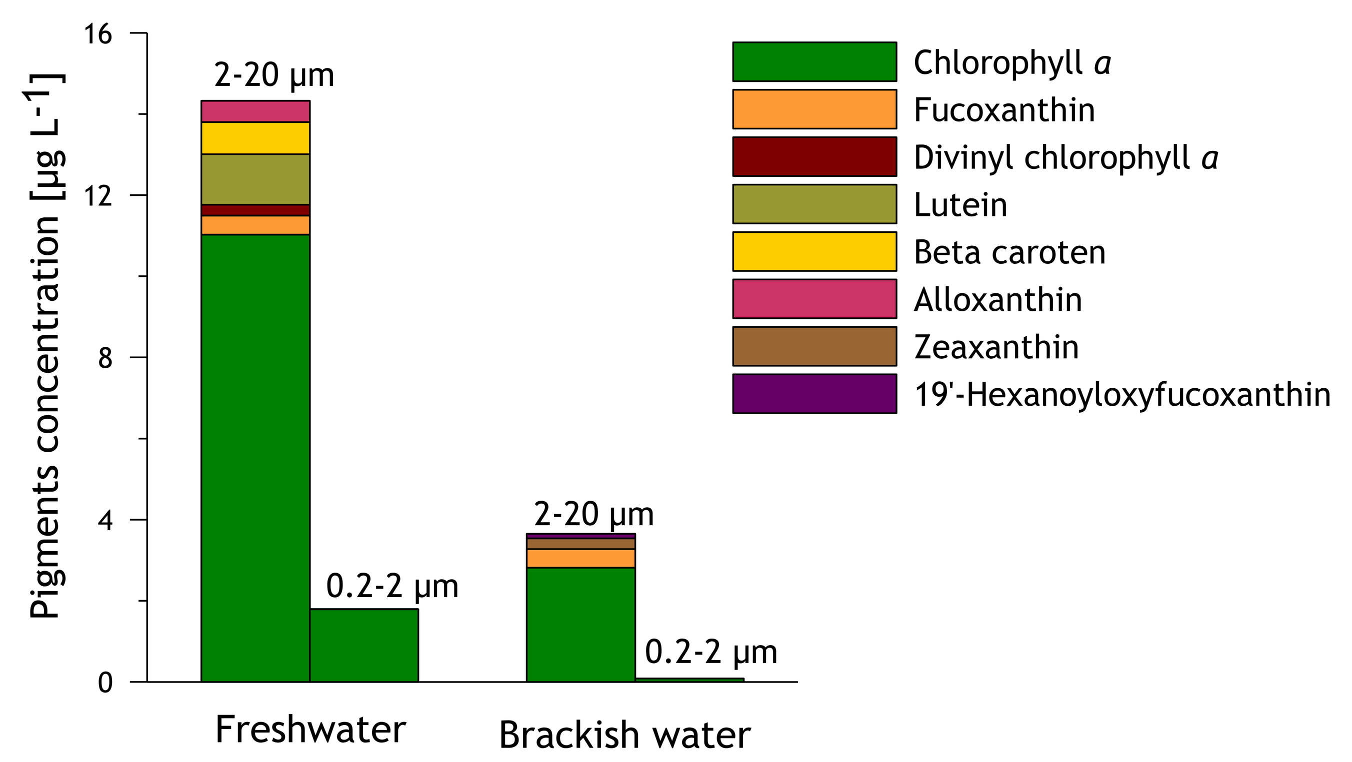


Fig.3. *Pigments concentrations of pico- and nanophytoplankton at experimental sites. Chorophyll a of nano (2–20 μm) and pico-fractions (0-2 μm) was measured by high performance liquid chromatography (HPLC).*

Microzooplankton community stucture

At both experimental sites microzooplankton was dominated by ciliates (99% of total abundance), while the number of metazoans was very low, composing 1% of the total microzooplankton abundance at both experimental sites. In the brackish water site nano-filterers were dominated by tintinnids and large naked oligotrichs: they shared 48% of the total ciliate abundance. In the freshwater site pico/nano-filterers and pico-filterers prevailed (77% of the total abundance) (Fig. 4).

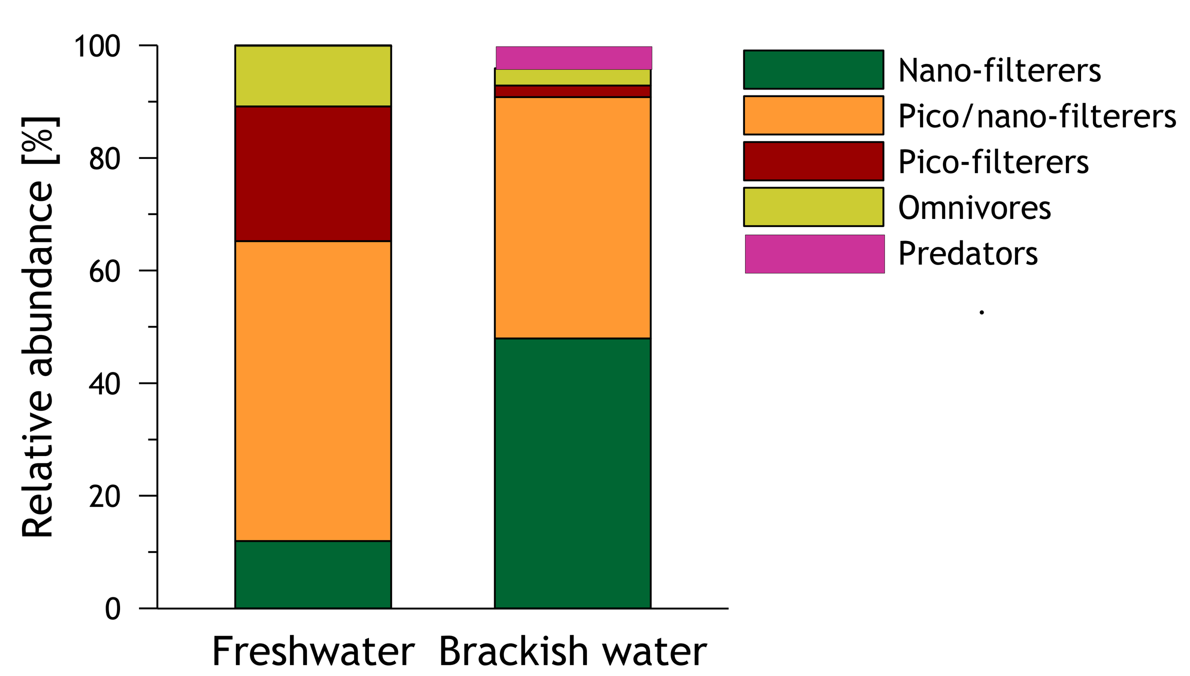


Fig.4. *Relative abundance of ciliate functional groups at experimental sites.*

Experimental design

Water samples for the experiments were collected from two sites: freshwater (salinity 0) in August and brackish water (salinity 6) in October 2009. Dilution experiment was performed according to Landry and Hassett (1982). **The dilution method is based on the reduction of encounter rates between predator (microzooplankton) and prey (phytoplankton) by progressive dilution of natural or whole communities with particle free water from the same water basin.**

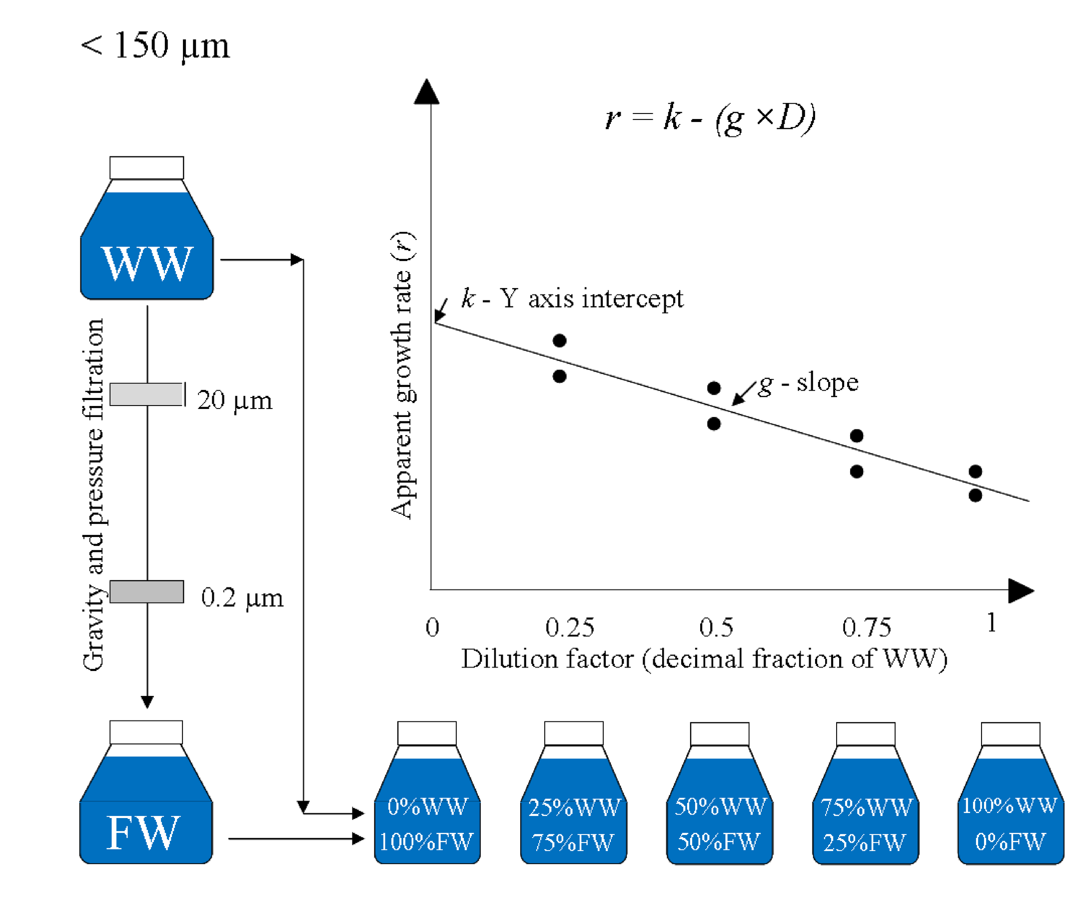


Fig. 2. *Scheme of the dilution experiment. WW – whole lagoon water, FW – particle free water.*

Freshwater site view. Photo Z. R. Gasiūnaitė

Brackish water site view.

Growth and grazing rates of phytoplankton

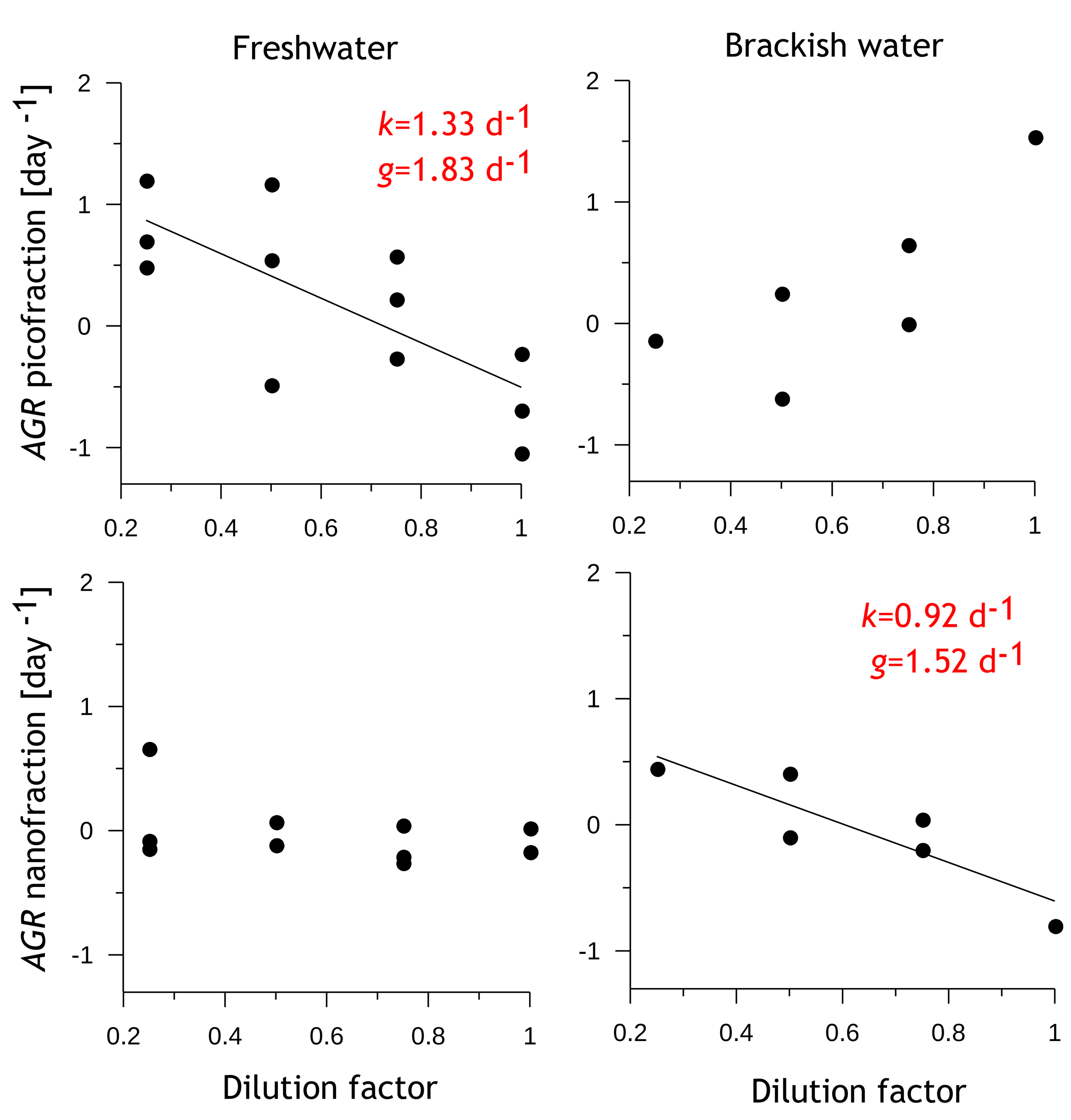
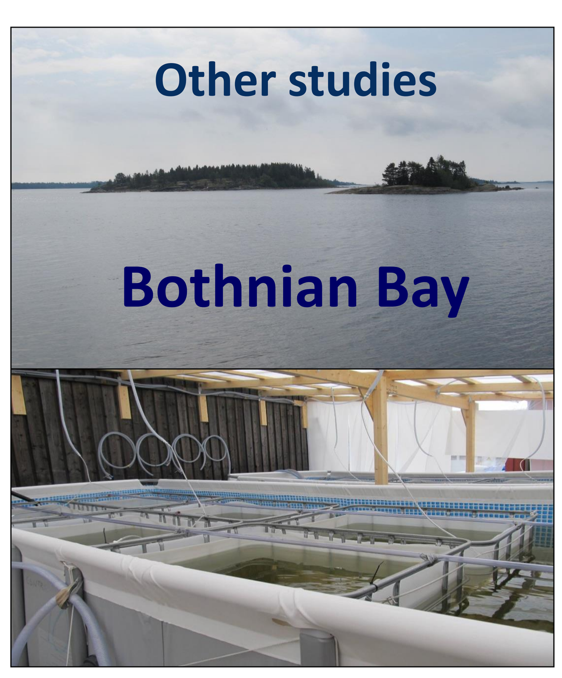


Fig.5. *Relationship between dilution factor and apparent growth rate (AGR) of chlorophyll a of pico- and nanofractions at both sites. Only significant slopes are presented in the graph.*

In the freshwater site the grazing rate (g = 1.8 d^{-1}) on the picofraction of the phytoplankton community exceeded the prey growth rate (k = 1.3 d^{-1}). In this site the grazing rate of nanophytoplankton was not estimated, because no significant linear relationship was observed between the apparent growth rate (*AGR*) of this fraction and the dilution factor (Fig. 5).

The *AGR* of the picofraction increased linearly with the dilution factor at the brackish water site and regression analysis resulted in a positive slope (Fig.5); therefore the microzooplankton grazing rate (g) is not interpretable. The growth rate of nanoalgae at the brackish water site was 0.9 d^{-1}, the grazing rate (1.5 d^{-1}).

Other studies




ARTICLE IN PRESS

Available online at www.sciencedirect.com

ScienceDirect

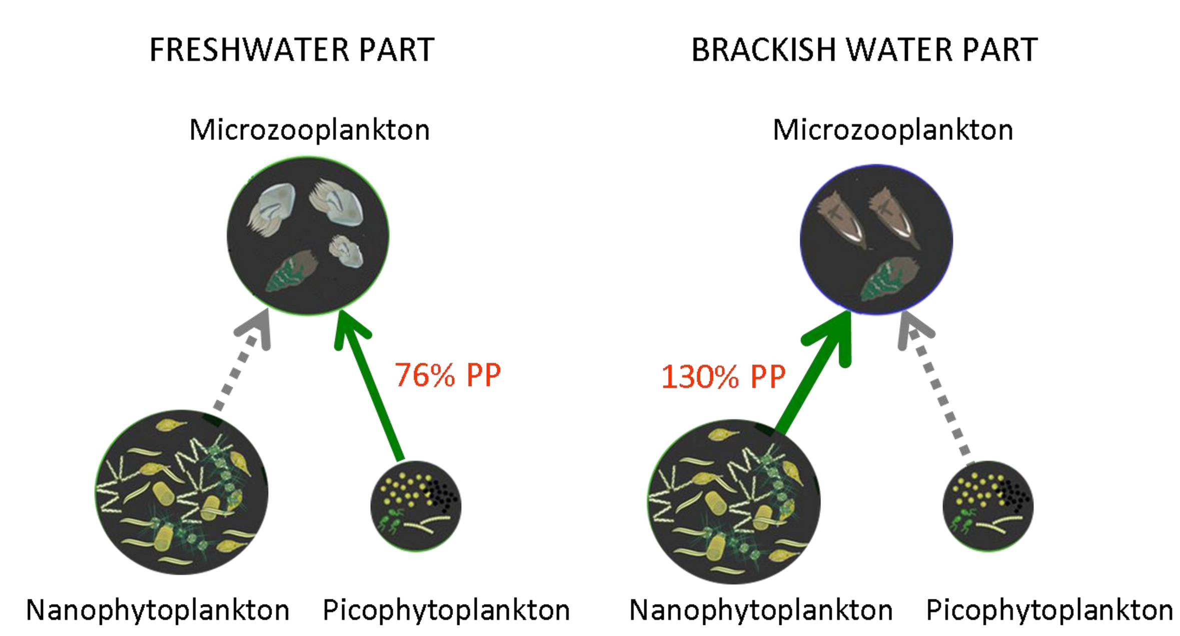
OCEANOLOGIA

ORIGINAL RESEARCH ARTICLE

Size-selective microzooplankton grazing on the phytoplankton in the Curonian Lagoon (SE Baltic Sea)

Evelina Grinienė[a,b,*], Sigitas Šulčius[c], Harri Kuosa[d]

Conclusion



Microzooplankton community removed up to 76% of the total daily PP of picophytoplankton.

Microzooplankton community removed up to 130% of the total daily PP of nanophytoplankton.

The observed differences were attributed to the changes in ciliate community trophic structure, with nano-filterers dominating the brackish water assemblage and pico-nano filterers prevailing in the freshwater part of the lagoon.